

**REMARKS**

In the Office Action mailed February 27, 2004 the Examiner: (1) rejected claims 1-4, 13 and 14 under 35 U.S.C. § 102(b) as being anticipated by Halman et al. (U.S. Patent No. 5,658,425) and (2) rejected claim 5 under 35 U.S.C. § 103(a) as being unpatentable over Halman et al. and further in view of Matsuura (U.S. Patent No. 5,721,156).

By this Amendment, Applicants have amended claims 1 and 14 and canceled claim 13 without prejudice or disclaimer of the subject matter thereof. No new matter has been added. Support for the new claim 17 can be found, for example, at page 8, first paragraph, of the Specification.

Applicants' representative thanks Examiner Allan Olsen for the in-person Interview on April 20, 2004.

Claim 1 is patentable at least because Halman et al. does not teach an etching method for etching an etching target film, including generating a plasma in an airtight processing chamber for etching said etching target film, wherein said etching target film is an organic film containing Si formed on said SiO<sub>2</sub> film, wherein a resist is used as a mask on said etching target film, and wherein said etching target film is etched until said SiO<sub>2</sub> film is exposed as an etch-stopper.

Specifically, as previously explained, Halman et al. discloses "etching of silicon oxide such as silicon dioxide" using an etching gas including "a fluoride-containing gas and a passivating nitrogen gas." Abstract. Thus, in particular, Halman et al. discloses that the silicon dioxide is etched using the etching gas. Halman et al. further discloses

that "[t]he fluoride-containing gas can be CF<sub>4</sub>, CHF<sub>3</sub>, C<sub>2</sub>F<sub>6</sub>, CH<sub>2</sub>F<sub>2</sub>, SF<sub>6</sub>, other Freons and mixtures thereof." *Id.* Halman et al., however, does not teach or suggest an etching method for etching an etching target film, including generating a plasma in an airtight processing chamber for etching said etching target film, wherein said etching target film is an organic film containing Si formed on said SiO<sub>2</sub> film, wherein a resist is used as a mask on said etching target film, and wherein said etching target film is etched until said SiO<sub>2</sub> film is exposed as an etch-stopper. In particular, for example, unlike the teachings of Halman et al., the etching target film is etched and the silicon dioxide film is exposed as an etch-stopper. Thus, claim 1 is patentable over Halman et al. for at least these reasons.

Claims 2-4 depend from claim 1 and thus are patentable at least for the reasons given above with respect to claim 1.

Concerning the rejection of claim 5 under 35 U.S.C. § 103(a), as being unpatentable over Halman et al. and further in view of Matsuura, Applicants respectfully submit that the Office Action does not set forth a *prima facie* case of obviousness. To establish a *prima facie* case of obviousness, three basic criteria must be satisfied. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify a reference or to combine references. M.P.E.P. § 2143. Second, there must be a reasonable expectation of success. *Id.* Third, the prior art reference (or references when combined) must teach or suggest all of the claim elements. *Id.* Moreover, the requisite teaching or suggestion to make the claimed combination and the reasonable

expectation of success must both be found in the prior art, not in Applicant's disclosure.

M.P.E.P. § 706.02(j) (citing In re Vaeck, 947 F.2d 488, 20 U.S.P.Q.2d (BNA) 1438 (Fed. Cir. 1991)).

Applicants respectfully submit that there is no *prima facie* case of obviousness because one of ordinary skill in the art would not have had any motivation or suggestion to combine the two references in the manner suggested by the Examiner. As discussed above, Halman et al. discloses "etching of silicon oxide such as silicon dioxide" using an etching gas including "a fluoride-containing gas and a passivating nitrogen gas."

Abstract. Matsuura is directed to a semiconductor device including an interlayer insulating film and a method of manufacturing the same. (col. 1, ll. 13-18). Matsuura, however, does not cure the deficiencies of the teachings of Halman et al. Specifically, Matsuura does not teach or suggest an etching method for etching an etching target, including generating a plasma in an airtight processing chamber for etching said etching target film, wherein said etching target film is an organic film containing Si formed on said SiO<sub>2</sub> film, wherein a resist is used as a mask on said etching target film, and wherein said etching target film is etched until said SiO<sub>2</sub> film is exposed as an etch-stopper. Thus, there would not have been any motivation for a person of ordinary skill in the art to combine the two references in the manner suggested by the Examiner. Accordingly, claim 5 is patentable over the cited references for at least these reasons.

Further, the TEOS layer formed by using an organic silane as a material in Matsuura is not an organic film containing Si, but rather is an inorganic SiO<sub>2</sub> layer. Thus, for this additional reason, even if Matsuura could be combined with Halman et al.,

the purported combination would not teach or suggest an etching method for etching an etching target, including generating a plasma in an airtight processing chamber for etching said etching target film, wherein said etching target film is an organic film containing Si formed on said SiO<sub>2</sub> film, wherein a resist is used as a mask on said etching target film, and wherein said etching target film is etched until said SiO<sub>2</sub> film is exposed as an etch-stopper, as required by claim 5.

Claim 14 directed to an etching method for etching an etching target film, requires generating a plasma in an airtight processing chamber for etching said etching target film, wherein said etching target film is an organic film containing Si formed on said SiO<sub>2</sub> film, an etching method for etching an etching target, including generating a plasma in an airtight processing chamber for etching said etching target film, wherein said etching target film is an organic film containing Si formed on said SiO<sub>2</sub> film, wherein a resist is used as a mask on said etching target film, and wherein said etching target film is etched until said SiO<sub>2</sub> film is exposed as an etch-stopper. As discussed above with respect to claims 1 and 5, neither Halman et al. nor Matsuura teaches or suggests an etching method for etching an etching target film, including generating a plasma in an airtight processing chamber for etching said etching target film, wherein said etching target film is an organic film containing Si formed on said SiO<sub>2</sub> film, wherein a resist is used as a mask on said etching target film, and wherein said etching target film is etched until said SiO<sub>2</sub> film is exposed as an etch-stopper. Thus, claim 14 is patentable for at least the reasons given above with respect to claims 1 and 5.

Further, claim 14 requires that the flow rate ratio of CF<sub>4</sub> and N<sub>2</sub> in said processing gas is essentially set within a range of  $1 \leq (\text{N}_2 \text{ flow rate} / \text{CF}_4 \text{ flow rate}) \leq 4$ . Applicants respectfully submit that Halman et al. does not disclose setting the flow rate ratio of CF<sub>4</sub> and N<sub>2</sub> for the processing gas within a range of  $1 \leq (\text{N}_2 \text{ flow rate} / \text{CF}_4 \text{ flow rate}) \leq 4$ . Instead, Halman et al. provides general suggestions, such as “[t]he flow rates of the various constituents of the etching gas are controlled to provide suitable etching while suppressing removal of the electrically conductive layers ....” (col. 4, ll. 45-47). Accordingly, claim 14 is patentable for at least this additional reason.

Newly added claim 17 requires among other things, an etching method for etching an etching target film, including generating a plasma in an airtight processing chamber for etching said etching target film, wherein said plasma forms contact holes at said etching target film, and wherein said etching target film is an organic polysiloxane film containing Si formed on a SiO<sub>2</sub> film, wherein a temperature of a bottom portion of at least one of the contact holes is maintained at about -20° C, a temperature of an opening portion of at least one of the contact holes is maintained at about 30° C, and a temperature of a sidewall portion of at least one of the contact holes is maintained at about 50° C.

As explained at the Interview and above, none of the cited references teaches or suggests the steps recited in newly added claim 17. Specifically, as previously explained, Halman et al. discloses “etching of silicon oxide such as silicon dioxide” using an etching gas including “a fluoride-containing gas and a passivating nitrogen gas.” Abstract. Halman et al. further discloses that “[t]he fluoride-containing gas can be

CF<sub>4</sub>, CHF<sub>3</sub>, C<sub>2</sub>F<sub>6</sub>, CH<sub>2</sub>F<sub>2</sub>, SF<sub>6</sub>, other Freons and mixtures thereof.” *Id.* Halman et al., however, does not teach or suggest an etching method for etching an etching target film, including generating a plasma in an airtight processing chamber for etching said etching target film, wherein said plasma forms contact holes at said etching target film, and wherein said etching target film is an organic polysiloxane film containing Si formed on a SiO<sub>2</sub> film, wherein a temperature of a bottom portion of at least one of the contact holes is maintained at about -20° C, a temperature of an opening portion of at least one of the contact holes is maintained at about 30° C, and a temperature of a sidewall portion of at least one of the contact holes is maintained at about 50° C. Thus, newly added claim 17 is patentable over Halman et al at least for this reason.

Accordingly, Applicants respectfully request reconsideration and reexamination of this application and the timely allowance of the pending claims.


The Office Action contains a number of statements reflecting characterizations of the claims and/or the related art. Regardless of whether any such statements are addressed above, Applicants decline to automatically subscribe to any statement or characterization in the Office Action.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

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